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# **GCE AS MARKING SCHEME**

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**SUMMER 2017**

**AS (NEW)  
BIOLOGY - UNIT 2  
2400U20-1**

## **INTRODUCTION**

This marking scheme was used by WJEC for the 2017 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

## UNIT 2 - Biodiversity and Physiology of Body Systems

### MARK SCHEME

#### GENERAL INSTRUCTIONS

##### Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

##### Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

##### Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statement. Award the middle mark in the level if most of the content statements are given and the communication statement is partially met. Award the lower mark if only the content statements are matched.

##### Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only  
ecf = error carried forward  
bod = benefit of doubt

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)	An organism that lives <u>on</u> (surface of) another organism / host(1) {Obtains nutrition from/ obtains food from/ feeds on} the host {at the expense of/ causes harm to} the host (1) ignore death	2			2		
		(ii)	(Absence of long legs) <u>so cannot leap / jump</u> (like flea)/ORA (1) ignore fly		1		1		
		(iii)	Domain – eukaryotic/ eukaryote/ description of eukaryotic characteristics (1) Kingdom – nervous {coordination/ system} / multicellular / heterotrophic / lacks cell wall / develop from a blastula (1)	2			2		
(b)	(i)	(i)	<i>Pthirus pubis</i> diverged from its common ancestor later than the common ancestor of gorillas and humans existed/ common ancestors were not alive at the same time/ pubic louse evolved after the common ancestor/ gorilla and human common ancestor died out before the pubic louse evolved(1) Reference to data (1)			2	2		
		(ii)	Similarity in {nucleotide / base / codon/ base pairs } sequences Ignore DNA sequence Accept DNA hybridisation with explanation of similarity in bases needing a higher temperature to separate the strands	1			1		
		(iii)	5		1		1	1	
(c)			Able to interbreed to produce fertile offspring/ OWTTE (1)	1			1		
			<b>Question 1 total</b>	<b>6</b>	<b>2</b>	<b>2</b>	<b>10</b>	<b>1</b>	<b>0</b>

Question		Marking details		Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)		<ul style="list-style-type: none"> <li>• <u>Reduce</u> {water/ heat} loss (1) NOT prevent</li> <li>• Filter air / Trap {dirt / dust / particles} (1) Ignore bacteria/ viruses Reject reference to function of cilia</li> <li>• Short diffusion {pathway/distance} (1)</li> <li>• Reduce surface tension / prevent collapse (of alveoli and tracheoles during expiration)/ prevent (alveoli/tracheoles) sticking together (1)</li> </ul>	1	3		4		
	(b)	(i)	Allows trachea to collapse slightly when food passes down the oesophagus/ allows peristalsis/ increase in size of oesophagus caused by passage of food/ owtte			1	1		
		(ii)	Xylem		1		1		
	(c)	(i)	<p><b>Any four (x1) from</b></p> <p><b>A.</b> (expanding the rib cage / pulling on outer pleural membrane) Lowers {pressure in pleural cavity / pleural pressure} (1)</p> <p><b>B.</b> <u>Inner</u> pleural membrane pulls on the lungs (1)</p> <p><b>C.</b> Which increases volume of {lungs / alveoli / thorax} (1)</p> <p><b>D.</b> Which decreases pressure in {lungs / alveoli} (1)</p> <p><b>E.</b> Below atmospheric pressure / so air moves in / credit correct reference to negative pressure breathing (1)</p> <p><b>Answer</b> must be in correct sequence (although some mark points may be omitted)</p>		4		4		
		(ii)	<p><b>Any one from</b></p> <ul style="list-style-type: none"> <li>• {Greater / higher} pressure/ faster pressure changes</li> <li>• {Greater / higher} volume/ faster changes in volume</li> <li>• More {rapid/ shorter} {inspiration/ expiration}/ more rapid breathing/ deeper breaths/ increased breathing rate</li> </ul>		1		1		
			<b>Question 2 total</b>	<b>1</b>	<b>9</b>	<b>1</b>	<b>11</b>	<b>0</b>	<b>0</b>

Question			Marking details	Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	<p><b>Any four (x1) from</b></p> <p>A. Xylem transports {water/minerals} {from roots / <u>up</u> the plant/ to the leaves}/ xylem allows transpiration (1) NOT nutrients</p> <p>B. Lack of water causes {leaf/ cells} to {lose turgor / become flaccid}/ cells become plasmolysed (1)</p> <p>C. Reduced surface area (1)</p> <p>D. {No/reduced} photosynthesis/ less water for photosynthesis (1)</p> <p>E. Less {products / named products} of photosynthesis (1)</p> <p>F. For respiration / growth (1)</p>		2	2	4		
		(ii)	Phloem transport is bidirectional / up <u>and</u> down plant (1) (so) Symptoms appear in both roots and leaves (in potato leaf roll) (1)		2		2		
	(b)	(i)	<p>A – sieve tube (element) NOT sieve plate</p> <p>B – companion cell (1)</p> <p><b>1 mark for both</b></p>	1			1		
		(ii)	<p>A - lacks {nucleus / nucleolus } / {fewer/ no} mitochondria / ER / Golgi/ organelles/ less cytoplasm (1)</p> <p>ORA Must be clear which cell is referred to</p>		1		1		
		(iii)	<p>Plasmodesmata (1)</p> <p>{Loading / unloading/ transport/ transfer} of sucrose / Transport of {ATP / proteins / enzymes / macromolecules} (1)</p>		2		2		
			<b>Question 3 total</b>	<b>1</b>	<b>7</b>	<b>2</b>	<b>10</b>	<b>0</b>	<b>0</b>

Question		Marking details		Marks Available													
				AO1	AO2	AO3	Total	Maths	Prac								
4	(a)		A – palisade mesophyll/ parenchyma (1) {Vertical/ elongated/ long/ columnar} cells/ high number of chloroplasts (1) B – spongy mesophyll (1) Air {spaces/ pockets}/ large surface area (1)	4			4										
	(b)	(i)	<b>Any 2 (x1) from</b> Humidity (1) Air currents/ wind speed/ air movement (1) Light <u>intensity</u> / wavelength of light(1)	2			2		2								
		(ii)	Any one from $\text{mm}^3 \text{cm}^{-2} \text{min}^{-1}$ $\text{mm}^3 \text{min}^{-1} \text{cm}^{-2}$ $\text{mm}^3/\text{cm}^2/\text{min}$ $\text{mm}^3/\text{min}/\text{cm}^2$		1		1	1	1								
		(iii)	{gap/ difference} between {range/ error} bars/ range bars do not overlap (1)			1	1	1	1								
		(iv)	Any <u>suitable</u> xeromorphic adaptation (1) correct explanation (1)														
			<table border="1"> <thead> <tr> <th>Adaptation</th> <th>Explanation</th> </tr> </thead> <tbody> <tr> <td>Fewer stomata</td> <td>Fewer spaces through which water vapour can be lost</td> </tr> <tr> <td>Thick cuticle</td> <td>Waterproof/ reduce evaporation</td> </tr> <tr> <td>Hairs/ sunken stomata/ stomata in pits/ rolled (curled) leaves</td> <td>Trap {humid /moist} air/ trap water vapour}reduce {water potential/ diffusion gradient}</td> </tr> </tbody> </table>	Adaptation	Explanation	Fewer stomata	Fewer spaces through which water vapour can be lost	Thick cuticle	Waterproof/ reduce evaporation	Hairs/ sunken stomata/ stomata in pits/ rolled (curled) leaves	Trap {humid /moist} air/ trap water vapour}reduce {water potential/ diffusion gradient}		2		2		
Adaptation	Explanation																
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Hairs/ sunken stomata/ stomata in pits/ rolled (curled) leaves	Trap {humid /moist} air/ trap water vapour}reduce {water potential/ diffusion gradient}																
		(v)	Answer= $\pm 2\%$ = 2 marks Accept $\pm 4\%$ = 2 marks (error at both ends of distance) If answer incorrect allow $1 / 50 \times 100 = 1$ mark $100 / 50 = 1$ mark		2		2	2	2								
		(vi)	Time over a longer distance / greater than 50 mm (1)			1	1		1								
			<b>Question 4 total</b>	<b>6</b>	<b>5</b>	<b>2</b>	<b>13</b>	<b>4</b>	<b>7</b>								

Question		Marking details		Marks Available							
				AO1	AO2	AO3	Total	Maths	Prac		
5	(a)			Bohr effect / shift (1)		1			1		
	(b)	(i)		70 % (1) 10 % (1)			2		2	2	
		(ii)		Reduced affinity of haemoglobin for oxygen/ (oxy)haemoglobin dissociates at a higher partial pressure (of oxygen) (1) More oxygen {released / unloaded/ dissociates}/ oxygen released (more) readily (1) Allow oxygen more readily dissociated from haemoglobin = 2 marks		2			2		
	(c)	(i)		CO <sub>2</sub> removed faster/ more CO <sub>2</sub> exhaled (1) Increases {diffusion / concentration} gradient (from blood into alveoli) (1)				2	2		
		(ii)		increased affinity of haemoglobin for oxygen / decreased dissociation of oxyhaemoglobin (1) Less oxygen {released/ available} (for respiration) (1)				2	2		
	(d)	(i)		X = carbonic anhydrase Y = carbonic acid / H <sub>2</sub> CO <sub>3</sub> Z = hydrogen ion / H <sup>+</sup> / proton 0/1 = 0 marks 2 correct = 1 mark, 3 correct = 2 marks		2			2		
		(ii)		{In solution/dissolved} in plasma / as carbamino compounds / as carbaminohaemoglobin (1)		1			1		
		(iii)		<b>Any three from:</b> <ul style="list-style-type: none"> <li>Chloride shift (1) must be in context of red blood cells</li> <li>(chloride ions) {enter/diffuse} into red blood cells in exchange for hydrogen carbonate ions (1)</li> <li>One to one exchange / reference to figures (1)</li> <li>To maintain (electrochemical) neutrality (in red blood cell)/ to {equalise/ balance/ maintain} charge (1)</li> </ul>		1	2		3		
				<b>Question 5 total</b>		<b>7</b>	<b>4</b>	<b>4</b>	<b>15</b>	<b>2</b>	<b>0</b>

Question		Marking details	Marks Available					
			AO1	AO2	AO3	Total	Maths	Prac
6	(a)	667 / 10 or 66.7 (1) = 67 (1) allow ecf for 1 mark 2 marks for correct answer		2		2	2	2
	(b)	All {results / replicates / groups} show the same trend pattern/ or suitable description (1)			1	1		1
	(c)	<b>Any two (x2) from:</b> (Variation in) temperature (1) Use a {thermostatically/ temperature} controlled water bath (1)  Difficulty deciding the end-point / subjective decision/ owtte (1) Use a colorimeter (1)  Difficulty in mixing the solutions (1) Agitate at regular intervals / or reasonable suggestion (1)  Difficulty deciding when to start the stop clock (1) Start as soon as solutions are completely mixed / or reasonable suggestion (1)			4	4		4
	(d)	<ul style="list-style-type: none"> <li>• Endopeptidase – {hydrolyses / breaks} (peptide) bonds within{polypeptide / protein/ amino acid chain}/ {hydrolyses / breaks} non-terminal bonds (1)</li> <li>• Exopeptidase – {hydrolyses / breaks} (peptide) bonds at ends of {polypeptide / protein/ amino acid chain}/ {hydrolyses / breaks} terminal bonds (1)</li> <li>• Enzyme mixture – endopeptidase creates more ends for exopeptidase/ owtte (1)</li> </ul>		3		3		
	(e)	Pepsin {optimum/ works best} in {acid conditions/ at pH{1/2/3} (1) Would be {inactive / denatured}/ would not work at pH 8 (1)	1	1		2		
		<b>Question 6 total</b>	<b>1</b>	<b>6</b>	<b>5</b>	<b>12</b>	<b>2</b>	<b>7</b>

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total	Maths	Prac
7	<p><b>Indicative content</b></p> <p><b>In systemic circulation:</b></p> <ul style="list-style-type: none"> <li>• {High pressure/ pressure increase} (to 120 mmHg) in {aorta/ arteries} is due to ventricular systole/ contraction of left ventricle.</li> <li>• High pressure needed to pump blood {round body/ long distance}</li> <li>• Pressure decrease (to 80 mmHg) in {arteries / aorta} is due to {diastole/ ventricular relaxation}.</li> <li>• High pressure is maintained due to elastic recoil of artery walls / closure of {semilunar / aortic} valve.</li> <li>• Pressure decrease in {arterioles/ capillaries} is due to {frictional resistance / blood flowing through a greater (total) {cross sectional/ surface area}.</li> <li>• Pressure decrease in capillaries is also due to tissue fluid formation.</li> <li>• low pressure/ flow rate in capillaries necessary for diffusion</li> <li>• Blood flow in veins due to massaging effect of skeletal muscles.</li> </ul> <p><b>In pulmonary circulation:</b></p> <ul style="list-style-type: none"> <li>• Pressure increase in pulmonary arteries due to {ventricular systole/ contraction of thinner walled right ventricle}.</li> <li>• Lower pressure (than systemic) due to {shorter distance / (only) to lungs}.</li> <li>• Pressure decrease (to about 8 mmHg) in pulmonary arteries is due to diastole / ventricle relaxation.</li> <li>• Pressure in capillaries is lower than systemic to prevent tissue fluid formation in the alveoli / reduce damage to alveoli / allow time for gas exchange.</li> </ul>	6	3		9		

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total	Maths	Prac
	<p><b>Benefit over single circulation:</b></p> <ul style="list-style-type: none"> <li>• Correct description of single and double circulation</li> <li>• Pressure is lost when blood passes through (gill) capillaries.</li> <li>• so blood flow through the systemic circulation of a fish is slower.</li> <li>• Double circulation maintains high pressure (in systemic circulation)</li> <li>• to meet the high metabolic demands of a mammal.</li> </ul>						

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total	Maths	Prac
	<p><b>7-9 marks</b> Detailed explanation of systemic circulation <b>And</b> Detailed explanation of pulmonary circulation <b>And</b> Detailed explanation of benefit over single circulation</p> <p><i>The candidate constructs an articulate, integrated account, correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses scientific conventions and vocabulary appropriately and accurately.</i></p> <p><b>4-6 marks</b> <b>Any two from</b> Explanation of systemic circulation Explanation of pulmonary circulation Explanation of benefit over single circulation</p> <p><i>The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate usually uses scientific conventions and vocabulary appropriately and accurately.</i></p>						

Question				Marking details	Marks Available						
					AO1	AO2	AO3	Total	Maths	Prac	
				<p><b>1-3 marks</b>  Brief explanation of systemic circulation  OR  Brief explanation of pulmonary circulation  OR  Brief explanation of benefit over single circulation</p> <p><i>The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate has limited use of scientific conventions and vocabulary.</i></p> <p><b>0 marks</b>  <i>The candidate does not make any attempt or give a relevant answer worthy of credit.</i></p>							
				<b>Question 6 total</b>	<b>6</b>	<b>3</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>0</b>	

**UNIT 2: BIODIVERSITY AND PHYSIOLOGY OF BODY SYSTEMS**  
**SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES**

<b>Question</b>	<b>AO1</b>	<b>AO2</b>	<b>AO3</b>	<b>TOTAL MARK</b>	<b>MATHS</b>	<b>PRAC</b>
1	6	2	2	10	1	0
2	1	9	1	11	0	0
3	1	7	2	10	0	0
4	6	5	2	13	4	7
5	7	4	4	15	2	0
6	1	6	5	12	2	7
7	6	3	0	9	0	0
<b>TOTAL</b>	<b>28</b>	<b>36</b>	<b>16</b>	<b>80</b>	<b>9</b>	<b>14</b>